6.6 Intersection of Lines and Planes Worksheet

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

1) In each case, determine if the line and the plane are parallel. If so, decide on distinct or coincident.

a) $\ell_1 : \begin{cases} x = 4 + 2t \\ y = -t \\ z = -1 - 4t \end{cases}$ $\pi_1 : 3x + 2y + z - 7 = 0$	b) $\ell_2 : \begin{cases} x = t \\ y = 2t \\ z = 3t \end{cases}$ $\pi_2 : x - y + 2z = 5$

2) In each case, determine if the plane and line intersect. If so, state the solution.

a) $[x, y, z] = [1, 2, 5] + t[1, -1, 2]$ $2x + 6y - z = 5$	b) $[x, y, z] = [6, 11, 1] + t[1, 5, 2]$ $x + 3y + 2z - 1 = 0$
c) $[x, y, z] = [9, 8, 3] + t[2, 1, 5]$ $z = 0$	d) $[x, y, z] = [4, 2, 6] + t[1, -2, 3]$ $2x + 5y - z - 34 = 0$
e) $[x, y, z] = [3, 2, -1] + t[-2, 1, 3]$ $x + 2y - 3z = 10$	f) $[x, y, z] = [4, 2, 6] + t[1, -2, 3]$ $-4x - 5y + 6z = 34$

3) Determine if each of the following lines intersects the plane: $\pi : [x, y, z] = [4, -15, -8] + s[1, -3, 1] + t[2, 3, 1]$. If so, how many intersections are there?

a) $[x, y, z] = [5, -9, 3] + k[1, -12, 2]$

b) $[x, y, z] = [-2, 9, -21] + k[2, -5, 4]$

c) $[x, y, z] = [3, -2, 1] + k[1, 4, -2]$

d) $[x, y, z] = [4, -24, -7] + k[-2, -3, -1]$

e) $[x, y, z] = [2, -3, 0] + k[-1, 3, -1]$

Copyright © 2026 Annie Bernatchez—All rights reserved.

f) $[x,\ y,\ z] = [9,\ 4,\ 1] + k[-2,\ 2,\ 4]$

4) Find the distance between each point and the given plane.

a) $P(1,\ 1,\ -1),\quad x + y - z - 3 = 0$

b) $P(7,\ -3,\ 2),\quad 2x - 3z - 1 = 0$

5) Find the distance between the planes $\pi_1 : 2x + 2y - z - 3 = 0$ and $\pi_2 : 4x + 4y - 2z + 9 = 0$

Answer Key

1. a) parallel and distinct b) not parallel

2. a) $\left(\frac{5}{3},\ \frac{4}{3},\ \frac{19}{3}\right)$ b) $(4,\ 1,\ -3)$ c) $\left(\frac{39}{5},\ \frac{37}{5},\ 0\right)$ d) $(2,\ 6,\ 0)$ e) $(3,\ 2,\ -1)$ f) $(5,\ 0,\ 9)$

3. a) No intersection b) 1 intersection c) 1 intersection d) Infinite solutions e) No intersection f) 1 intersection

4. a) 0 b) 1.94

5. 2.5

Copyright © 2026 Annie Bernatchez—All rights reserved.